Iron-tolerant cyanobacteria: ecophysiology and fingerprinting

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Although the iron-dependent physiology of marine and freshwater cyanobacterial strains has been the focus of extensive study, very few studies dedicated to the physiology and diversity of cyanobacteria inhabiting iron-depositing hot springs have been conducted. One of the few studies that have been conducted [B. Pierson, 1999] found that cyanobacterial members of iron depositing bacterial mat communities might increase the rate of iron oxidation in situ and that ferrous iron concentrations up to 1 mM significantly stimulated light dependent consumption of bicarbonate, suggesting a specific role for elevated iron in photosynthesis of cyanobacteria inhabiting iron-depositing hot springs.

Our recent studies pertaining to the diversity and physiology of cyanobacteria populating iron-depositing hot springs in Great Yellowstone area (Western USA) indicated a number of different isolates exhibiting elevated tolerance to Fe^{3+} (up to 1 mM). Moreover, stimulation of growth was observed with increased Fe^{3+} (0.02 – 0.4 mM).

Molecular fingerprinting of unialgal isolates revealed a new cyanobacterial genus and species Chroogloeocystis siderophila, an unicellular cyanobacterium with significant EPS sheath harboring colloidal Fe^{3+} from iron enriched media. Our preliminary data suggest that some filamentous species of iron-tolerant cyanobacteria are capable of exocytosis of iron precipitated in cytoplasm.

Prior to 2.4 Ga global oceans were likely significantly enriched in soluble iron [Lindsay et al, 2003], conditions which are not conducive to growth of most contemporary oxygenic cyanobacteria. Thus, iron-tolerant CB may have played important physiological and evolutionary roles in Earths history.

Pierson, B. K. et al (1999) Appl. Environ. Microbiol. **65:** 5474-83.

Lindsay, J.F. and Brasier, M.D. (2003) In Eriksson, P.G., Altmann, W., Nelson, D.R., Mueller, W.U. and Catuneau, O., (eds.), The Precambrian Earth: Tempos and Events, Elsevier, Chapter 5.3, 388-403.

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